MARS GLOBAL SURVEYOR

MISSION ΔV BUDGET

MISSION ΔV CAPABILITY STATUS AND

A PROPELLANT LOADING STRATEGY OPTION

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=> PROJECT DIRECTION AS A RESULT OF THE SPACECRAFT INJECTED MASS REVIEWS (FEBRUARY 1996)

- MGS SPACECRAFT INJECTED MASS: 1060 KG
  - LMA WEIGHING UNCERTAINTIES: ±0.10 % => 1.0 KG
    - (NOMINAL SPACECRAFT INJECTED MASS = 1060 KG)
  - MDA WEIGHING UNCERTAINTIES: ±0.05 % => 1.6 KG
    - (NOMINAL DELTA 3RD STAGE / SPACECRAFT COMBINATION = 3280.8 KG)

- SPACECRAFT DRY MASS WILL BE AS DELIVERED (UNKNOWN)
  - 2/27/96: MAX ALLOWABLE ~678.8 KG
  - 6/13/96: CBE =670.3 KG CBE + GROWTH =673.8 KG

- TOTAL MISSION ΔV CAPABILITY (FREE PARAMETER) TO ACCOMODATE THE DELIVERED SPACECRAFT DRY MASS
  - AREAS FOR ΔV REDUCTIONS IDENTIFIED

    => MISSION ΔV CAPABILITY BELOW 1290 M/S POSSIBLE
  - MISSION ΔV CAPABILITY IS CONSTRAINED BY THE HYDRAZINE (N_2H_4) TANK SIZE LIMITATIONS

- BASELINE MISSION ΔV BUDGET (ALLOCATION) WAS ADOPTED IN SEPTEMBER 1995 AND PRESENTED AT THE MISSION SYSTEM CDR
  - DEVELOPED PRIMARILY FROM THE ΔV REQUIREMENTS NECESSARY FOR THE FIRST LAUNCH DATE (I.E. OPENING OF THE LAUNCH PERIOD)
  - SIGNIFICANT NUMBER OF KEY (INTERLEAVING) ASSUMPTIONS WENT INTO THE FORMULATION OF THE MISSION ΔV BUDGET
    - SINGLE ΔV BUDGET (LOADING STRATEGY) FOR THE ENTIRE LAUNCH PERIOD
    - MISSION CONTINGENCY ΔV RESERVE ERODES NEAR THE CLOSING OF THE LAUNCH PERIOD (ONLY AEROBRAKING POP-UP ΔV IS MAINTAINED - ALL HYDRZ)
  - TABULATED ON PAGE 5 (LINE ITEM ALLOCATIONS)

- ΔV REDUCTIONS DISCUSSED AT THE FEBRUARY 1996 SPACECRAFT INJECTED MASS REVIEW
  - NEW PQ ALTITUDE REQUIRED POST-MAPPING (BASED ON SHORTENED RELAY PHASE)
  - RELAY TRANSLATIONAL AND ROTATIONAL ΔV REQUIREMENTS REVISITED (BASED ON SHORTENED RELAY PHASE)
  - NEW CRUISE TCM ΔV BUDGET ASSESSMENT FOR OPENING AND CLOSING OF THE LAUNCH PERIOD (BASED ON THE MDA PMA REPORT INJECTION COVARIANCES)

- AS SPACECRAFT HAS PROCEEDED THROUGH ATLO, ESTIMATES OF THE SPACECRAFT DRY MASS HAVE TENDED TOWARD CONVERGENCE (670 TO 674 KG RANGE)

- THE RANGE OF EXPECTED SPACECRAFT DRY MASS VALUES IS INCONSISTENT WITH THE REQUIRED SPACECRAFT INJECTED MASS (1060.0 KG), THE MISSION SYSTEM CDR ΔV BUDGET (1290.0 M/S), AND THE HYDRAZINE TANK LIMITATIONS

- A REVIEW OF THE PROPELLANT LOADING STRATEGY (I.E. MISSION ΔV CAPABILITY AND THE ASSOCIATED ΔV ALLOCATIONS) WAS INITIATED => A MODIFIED MISSION SYSTEM CDR ΔV BUDGET HAS BEEN PROPOSED RESULTING IN A NEW ΔV 1290 M/S CAPABILITY
  - (1) NO CHANGE THROUGH AEROBRAKING POP-UP ΔV LINE ITEM
  - (2) TAKE ΔV REDUCTIONS FOR 6-MONTH RELAY MISSION
  - (3) ADJUST PQ ΔV FOR CONSITENCY WITH (2) (Hp = 414 KM)
  - (4) ADJUST MISSION RESERVES ΔV (BIPROPELLANT) TO MATCH SPACECRAFT DRY MASS
  - (5) IF SPACECRAFT DRY MASS < 671.1 KG, BALLAST WITH OXIDIZER TO ACHIEVE 1060 KG SPACECRAFT INJECTED MASS

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MARS GLOBAL SURVEYOR SPACECRAFT ΔV/PROPULSIVE PERFORMANCE

MISSION SYSTEM CDR ΔV BUDGET (9/95)

Spacecraft Injected Mass (kg) 1060.0

MISSION PHASE	MANEUVER	MONOPROP TRANSLATIONAL Isp (s)	MONOPROP TRANSLATIONAL ΔV Reqd (m/s)	BIPROP TRANSLATIONAL Isp (s)	BIPROP TRANSLATIONAL ΔV Reqd (m/s)	MONOPROP ROTATIONAL Isp (s)	MONOPROP ROTATIONAL ΔV Reqd (m/s)	PROPELLANT BREAKDOWN M-HYDRZ (kg)	PROPELLANT BREAKDOWN B-HYDRZ (kg)	PROPELLANT BREAKDOWN NTO (kg)	POSTBURN S/C MASS (kg)	EST. BURN DURATION MONOPROP #T	EST. BURN DURATION MONOPROP (s)	EST. BURN DURATION BIPROP (s)
CRUISE ΔV95	TCM-1/2	220.0	0.0	317.0	49.9	220.0	0.3	0.15	9.12	7.76	1042.97	-	-	79.7
	TCM-3/4	220.0	3.0	255.0	0.0	220.0	0.0	1.45	0.00	0.00	1041.52	4	175.7	-
CAPTURE	MOI Rp = 3700 km Per = 48 Hr	220.0	0.0	317.0	975.6	220.0	5.9	2.84	151.64	128.90	758.14	-	-	1332.7
Aerobraking Walk-in	AB-1	220.0	0.0	315.0	8.0	220.0	0.1	0.04	1.06	0.90	756.14	-	-	9.2
	AB-2	220.0	1.5	255.0	0.0	190.0	0.0	0.53	0.00	0.00	755.62	4	63.7	-
	AB-3	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	755.44	4	21.2	-
	AB-4	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	755.27	4	21.2	-
Aerobraking Main Phase	ABM Translation	220.0	5.0	255.0	0.0	190.0	0.0	1.75	0.00	0.00	753.52	-	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	5.0	2.02	0.00	0.00	751.50	-	-	-
Aerobraking Walk-out	ABM Translation	220.0	20.0	255.0	0.0	190.0	0.0	6.93	0.00	0.00	744.57	-	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	30.0	11.89	0.00	0.00	732.67	-	-	-
TransMap	ABX	220.0	0.0	317.0	60.2	220.0	0.4	0.14	7.60	6.46	718.49	-	-	66.3
	TMO	220.0	0.0	317.0	16.1	220.0	0.1	0.03	2.01	1.71	714.74	-	-	17.5
Mission Contingency	Aerobraking Pop-Up	220.0	2.5	315.0	14.5	190.0	0.0	0.83	1.81	1.54	710.57	-	-	15.7
	ΔV Reserves	220.0	2.0	315.0	10.7	190.0	0.0	0.66	1.33	1.13	707.45	-	-	11.5
	OTM-1 (Frzn)	220.0	0.0	315.0	7.5	190.0	0.0	0.00	0.93	0.79	705.74	-	-	8.0
MAPPING *Drag Dens 95%*	OTM (Drag/GTE)	220.0	3.9	255.0	0.0	190.0	0.0	1.27	0.00	0.00	704.46	-	-	0.0
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	40.0	14.96	0.00	0.00	689.50	-	-	-
ADDITIONAL ΔV REQUIRED	QUARANTINE ORBIT (PQ)	220.0	12.0	255.0	0.0	190.0	0.0	3.82	0.00	0.00	685.68	4	463.5	-
RELAY *Drag Dens 95%*	OTM (Drag)	220.0	4.8	255.0	0.0	190.0	0.0	1.52	0.00	0.00	684.15	-	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	10.0	3.66	0.00	0.00	680.49	-	-	-
	SUB-TOTALS		55.7		1142.5		91.8	54.85	175.49	149.17				
	MISSION TOTAL ΔV		1290.0			S/C Dry Mass (kg)		670.30	Adjusted S/C Dry Mass (kg)		671.94			

Mission Total ΔV Breakdown	
Translational ΔV	1198.2
Rotational ΔV	91.8
Bipropellant ΔV	1142.5
Monopropellant ΔV	147.5

Engine	Thrust (N)	Prop Tanks	Usable	Load Error	Usable Plus Error	Max Usable
BIPROP	658.7	N204	149.17	0.34	149.51	164.9
MPROP	4.45	(2x) N2H4	230.34	0.62	230.96	230.2
Ge (m/s²)		9.80665	BIPROP MIX RATIO		0.85	

NOT TANKABLE

PROPELLANT (kg)	
Usable	379.51
Unusable 2%	7.59
Load Error	0.96
Oxidizer Ballast	1.64
Total Prop	389.70

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MDJ-5
7/19/96

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MARS GLOBAL SURVEYOR SPACECRAFT ΔV/PROPULSIVE PERFORMANCE
Launch Date - 11/6/96
Launch Period Open - Propellant Loading

MODIFIED MISSION SYSTEM CDR ΔV BUDGET (5/96)
SPACECRAFT INJECTED MASS (kg) 1060.0

MISSION PHASE	MANEUVER	MONOPROP TRANSLATIONAL Isp (s)	MONOPROP TRANSLATIONAL ΔV Reqd (m/s)	BIPROP TRANSLATIONAL Isp (s)	BIPROP TRANSLATIONAL ΔV Reqd (m/s)	MONOPROP ROTATIONAL Isp (s)	MONOPROP ROTATIONAL ΔV Reqd (m/s)	PROPELLANT BREAKDOWN M-HYDRZ (kg)	PROPELLANT BREAKDOWN B-HYDRZ (kg)	PROPELLANT BREAKDOWN NTO (kg)	POSTBURN S/C MASS (kg)	EST. BURN DURATION MONOPROP #T	EST. BURN DURATION MONOPROP (s)	EST. BURN DURATION BIPROP (s)
CRUISE ΔV95	TCM-1/2	220.0	0.0	317.0	49.9	220.0	0.3	0.15	9.12	7.76	1042.97	-	-	79.7
	TCM-3/4	220.0	3.0	255.0	0.0	220.0	0.0	1.45	0.00	0.00	1041.52	4	175.7	-
CAPTURE	MOI Rp = 3700 km Per = 48 Hr	220.0	0.0	317.0	975.6	220.0	5.9	2.84	151.64	128.90	758.14	-	-	1332.7
Aerobraking Walk-in	AB-1	220.0	0.0	315.0	8.0	220.0	0.1	0.04	1.06	0.90	756.14	-	-	9.2
	AB-2	220.0	1.5	255.0	0.0	190.0	0.0	0.53	0.00	0.00	755.62	4	63.7	-
	AB-3	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	755.44	4	21.2	-
	AB-4	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	755.27	4	21.2	-
Aerobraking Main Phase	ABM Translation	220.0	5.0	255.0	0.0	190.0	0.0	1.75	0.00	0.00	753.52	-	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	5.0	2.02	0.00	0.00	751.50	-	-	-
Aerobraking Walk-out	ABM Translation	220.0	20.0	255.0	0.0	190.0	0.0	6.93	0.00	0.00	744.57	-	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	30.0	11.89	0.00	0.00	732.67	-	-	-
TransMap	ABX	220.0	0.0	317.0	60.2	220.0	0.4	0.14	7.60	6.46	718.49	-	-	66.3
	TMO	220.0	0.0	317.0	16.1	220.0	0.1	0.03	2.01	1.71	714.74	-	-	17.5
Mission Contingency	Aerobraking Pop-Up	220.0	2.5	315.0	14.5	190.0	0.0	0.83	1.81	1.54	710.57	-	-	15.7
	ΔV Reserves	220.0	2.0	315.0	26.0	190.0	0.0	0.66	3.22	2.74	703.95	-	-	27.9
	OTM-1 (Frzn)	220.0	0.0	315.0	7.5	190.0	0.0	0.00	0.92	0.78	702.25	-	-	8.0
MAPPING Drag Dens 95%	OTM (Drag/GTE)	220.0	3.9	255.0	0.0	190.0	0.0	1.27	0.00	0.00	700.98	-	-	0.0
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	40.0	14.89	0.00	0.00	686.09	-	-	-
ADDITIONAL ΔV REQUIRED	QUARANTINE ORBIT (PQ)	220.0	17.0	255.0	0.0	190.0	0.0	5.38	0.00	0.00	680.70	4	652.7	-
RELAY Drag Dens 95%	OTM (Drag)	220.0	1.0	255.0	0.0	190.0	0.0	0.32	0.00	0.00	680.39	-	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	2.0	0.73	0.00	0.00	679.66	-	-	-
	SUB-TOTALS		56.9		1157.8		83.8	52.19	177.38	150.77				
	MISSION TOTAL ΔV		1298.5			S/C Dry Mass (kg)		670.30	Adjusted S/C Dry Mass (kg)		671.09			

Mission Total ΔV Breakdown	
Translational ΔV	1214.7
Rotational ΔV	83.8
Bipropellant ΔV	1157.8
Monopropellant ΔV	140.7

	Engine Thrust (N)	Prop Tanks	Usable	Load Error	Usable Plus Error	Max Usable
BIPROP	658.7	N204	150.77	0.34	151.11	164.9
MPROP	4.45	(2x) N2H4	229.57	0.62	230.19	230.2
Ge (m/s²)		9.80665	BIPROP MIX RATIO		0.85	

PROPELLANT (kg)	
Usable	380.34
Unusable 2%	7.61
Load Error	0.96
Oxidizer Ballast	0.79
Total Prop	389.70

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MARS GLOBAL SURVEYOR SPACECRAFT MANEUVER EXECUTION
Modified Mission System CDR ΔV Budget (5/96)
Launch Date - 11/6/96

SPACECRAFT INJECTED MASS (kg)	1060.0
Spacecraft Dry Mass (kg)	670.3
Total Propellant (kg)	389.7

	Engine Thrust (N)	Propellant Tanks	Load Error	Usable Load	Usable Plus Error	Max Usable	Unusable 2%	Oxidizer Ballast	Tank Totals	Tank Redlines	Ge (m/s²) 9.80665
BIPROP	658.7	NTO (kg)	0.34	150.77	151.11	164.9	3.02	0.79	154.92	4.15	BIPROP MIX RATIO
MPROP	4.45	(2x) N2H4 (kg)	0.62	229.57	230.19	230.2	4.59	-	234.78	5.21	0.85

*5% Ullage

MISSION PHASE	MANEUVER	MONOPROP TRANSLATIONAL Isp (s)	MONOPROP TRANSLATIONAL ΔV Reqd (m/s)	BIPROP TRANSLATIONAL Isp (s)	BIPROP TRANSLATIONAL ΔV Reqd (m/s)	MONOPROP ROTATIONAL Isp (s)	MONOPROP ROTATIONAL ΔV Reqd (m/s)	PROPELLANT USAGE M-HYDRZ (kg)	PROPELLANT USAGE B-HYDRZ (kg)	PROPELLANT USAGE NTO (kg)	PROPELLANT REMAINING HYDRZ (kg)	PROPELLANT REMAINING NTO (kg)	POSTBURN S/C MASS (kg)	BURN DURATION #T	BURN DURATION (s)
CRUISE ΔV95	TCM-1/2	220.0	0.0	317.0	49.9	220.0	0.3	0.15	9.12	7.76	225.51	147.16	1042.97	n/a	79.7
	TCM-3/4	220.0	3.0	255.0	0.0	220.0	0.0	1.45	0.00	0.00	224.06	147.16	1041.52	4	175.7
CAPTURE	MOI Rp = 3700 km Per = 48 Hr	220.0	0.0	317.0	975.6	220.0	5.9	2.84	151.64	128.90	69.57	18.26	758.14	n/a	1332.7
Aerobraking Walk-in	AB-1	220.0	0.0	315.0	8.0	220.0	0.1	0.04	1.06	0.90	68.48	17.36	756.14	n/a	9.2
	AB-2	220.0	1.5	255.0	0.0	190.0	0.0	0.53	0.00	0.00	67.95	17.36	755.62	4	63.7
	AB-3	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	67.78	17.36	755.44	4	21.2
	AB-4	220.0	0.5	255.0	0.0	190.0	0.0	0.18	0.00	0.00	67.60	17.36	755.27	4	21.2
Aerobraking Main Phase	ABM Translation	220.0	5.0	255.0	0.0	190.0	0.0	1.75	0.00	0.00	65.85	17.36	753.52	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	5.0	2.02	0.00	0.00	63.84	17.36	751.50	-	-
Aerobraking Walk-out	ABM Translation	220.0	20.0	255.0	0.0	190.0	0.0	6.93	0.00	0.00	56.90	17.36	744.56	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	30.0	11.89	0.00	0.00	45.01	17.36	732.67	-	-
TransMap	ABX	220.0	0.0	317.0	60.2	220.0	0.4	0.14	7.60	6.46	37.28	10.91	718.48	n/a	66.3
	TMO	220.0	0.0	317.0	16.1	220.0	0.1	0.03	2.01	1.71	35.24	9.20	714.74	n/a	17.5
Mission Contingency	Aerobraking Pop-Up	220.0	2.5	315.0	14.5	190.0	0.0	0.83	1.81	1.54	32.60	7.66	710.56	n/a	15.7
	ΔV Reserves	220.0	2.0	315.0	26.0	190.0	0.0	0.66	3.22	2.74	28.72	4.93	703.95	n/a	27.9
	OTM-1 (Frzn)	220.0	0.0	315.0	7.5	190.0	0.0	0.00	0.92	0.78	27.80	4.14	702.24	n/a	8.0
MAPPING *Drag Dens 95%*	OTM (Drag/GTE)	220.0	3.9	255.0	0.0	190.0	0.0	1.27	0.00	0.00	26.53	4.14	700.98	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	40.0	14.89	0.00	0.00	11.64	4.14	686.09	-	-
ADDITIONAL ΔV REQUIRED	QUARANTINE ORBIT (PQ)	220.0	17.0	255.0	0.0	190.0	0.0	5.38	0.00	0.00	6.26	4.14	680.70	4	652.7
RELAY *Drag Dens 95%*	OTM (Drag)	220.0	1.0	255.0	0.0	190.0	0.0	0.32	0.00	0.00	5.94	4.14	680.39	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	2.0	0.73	0.00	0.00	5.21	4.14	679.66	-	-
	SUB-TOTALS		56.9		1157.8		83.8	52.19	177.38	150.77	S/C Dry Mass (kg)		670.30		
	MISSION TOTAL ΔV		1298.5												

Mars Global Surveyor

MARS GLOBAL SURVEYOR SPACECRAFT MANEUVER EXECUTION
Modified Mission System CDR ΔV Budget (5/96)
Launch Date - 11/25/96
(Minimum Spacecraft Mass at Aerobraking Start)

SPACECRAFT INJECTED MASS (kg)	1060.0
Spacecraft Dry Mass (kg)	670.3
Total Propellant (kg)	389.7

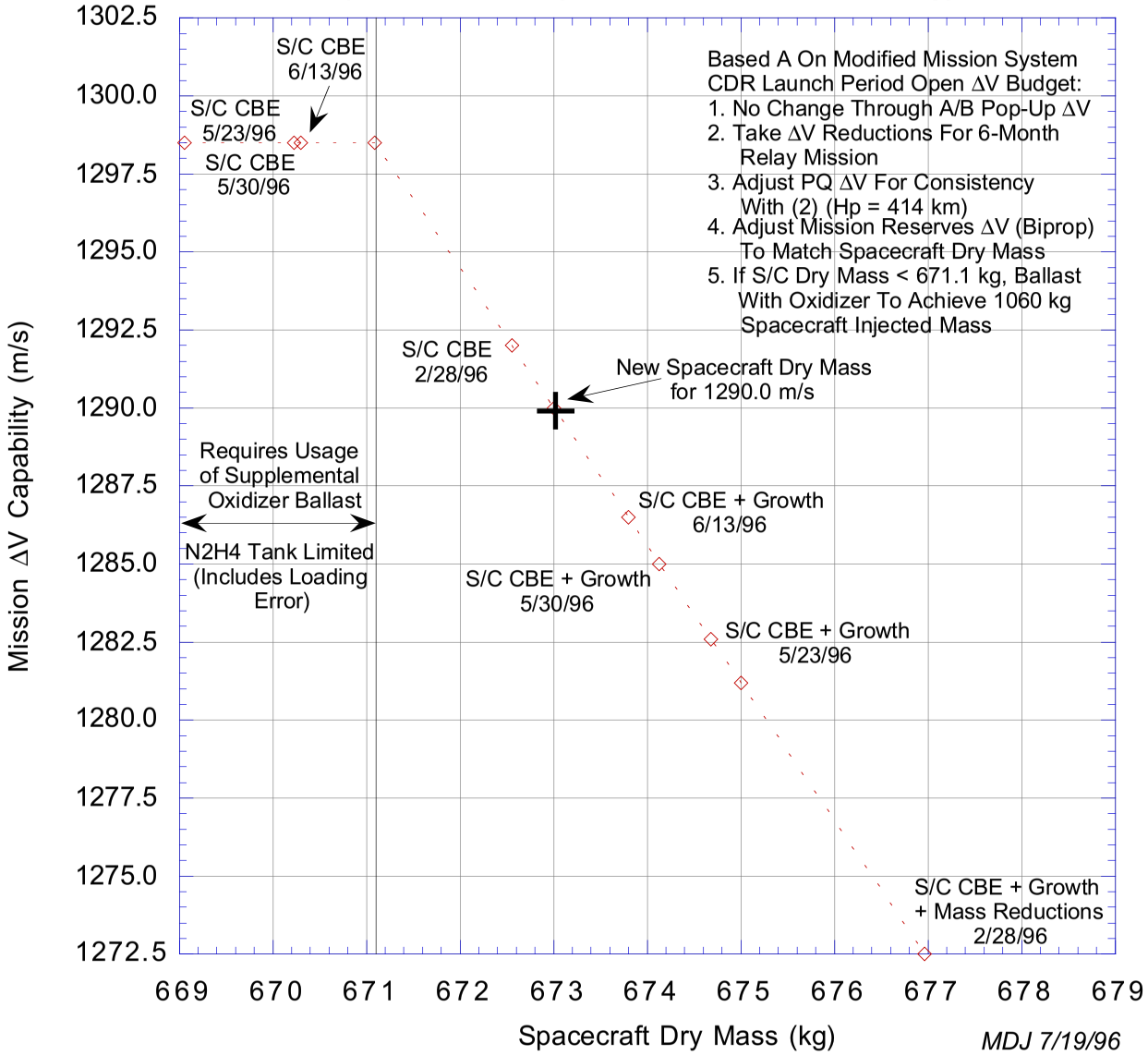
Engine Thrust (N)		Propellant Tanks	Load Error	Usable Load	Usable Plus Error	Max Usable*	Unusable 2%	Oxidizer Ballast	Tank Totals	Tank Redlines	Ge (m/s²) 9.80665 BIPROP MIX RATIO
BIPROP	658.7	NTO (kg)	0.34	150.77	151.11	164.9	3.02	0.79	154.92	4.15	
MPROP	4.45	(2x) N2H4 (kg)	0.62	229.57	230.19	230.2	4.59	-	234.78	5.21	0.85

*5% Ullage

MISSION PHASE	MANEUVER	MONOPROP TRANSLATIONAL Isp (s)	MONOPROP TRANSLATIONAL ΔV Reqd (m/s)	BIPROP TRANSLATIONAL Isp (s)	BIPROP TRANSLATIONAL ΔV Reqd (m/s)	MONOPROP ROTATIONAL Isp (s)	MONOPROP ROTATIONAL ΔV Reqd (m/s)	PROPELLANT USAGE M-HYDRZ (kg)	PROPELLANT USAGE B-HYDRZ (kg)	PROPELLANT USAGE NTO (kg)	PROPELLANT REMAINING HYDRZ (kg)	PROPELLANT REMAINING NTO (kg)	POSTBURN S/C MASS (kg)	BURN DURATION #T	BURN DURATION (s)
CRUISE ΔV95	TCM-1/2	220.0	0.0	317.0	49.9	220.0	0.3	0.15	9.12	7.76	225.51	147.16	1042.97	n/a	79.7
	TCM-3/4	220.0	3.0	255.0	0.0	220.0	0.0	1.45	0.00	0.00	224.06	147.16	1041.52	4	175.7
CAPTURE	MOI Rp = 3700 km Per = 48 Hr	220.0	0.0	317.0	981.3	220.0	5.9	2.84	152.40	129.54	68.82	17.62	756.74	n/a	1339.5
Aerobraking Walk-in	AB-1	220.0	0.0	315.0	8.0	220.0	0.1	0.04	1.06	0.90	67.73	16.72	754.75	n/a	9.2
	AB-2	220.0	1.5	255.0	0.0	190.0	0.0	0.52	0.00	0.00	67.20	16.72	754.23	4	63.6
	AB-3	220.0	0.5	255.0	0.0	190.0	0.0	0.17	0.00	0.00	67.03	16.72	754.05	4	21.2
	AB-4	220.0	0.5	255.0	0.0	190.0	0.0	0.17	0.00	0.00	66.85	16.72	753.88	4	21.2
Aerobraking Main Phase	ABM Translation	220.0	5.0	255.0	0.0	190.0	0.0	1.75	0.00	0.00	65.11	16.72	752.13	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	5.0	2.02	0.00	0.00	63.09	16.72	750.12	-	-
Aerobraking Walk-out	ABM Translation	220.0	11.0	255.0	0.0	190.0	0.0	3.81	0.00	0.00	59.28	16.72	746.30	-	-
	ABM Rotation	220.0	0.0	255.0	0.0	190.0	26.5	10.54	0.00	0.00	48.74	16.72	735.76	-	-
TransMap	ABX	220.0	0.0	317.0	65.8	220.0	0.4	0.14	8.33	7.08	40.27	9.64	720.22	n/a	72.7
	TMO	220.0	0.0	317.0	17.9	220.0	0.1	0.03	2.24	1.90	38.00	7.74	716.05	n/a	19.5
Mission Contingency	Aerobraking Pop-Up	220.0	2.5	315.0	14.5	190.0	0.0	0.83	1.81	1.54	35.36	6.20	711.87	n/a	15.7
	ΔV Reserves	220.0	11.0	315.0	12.0	190.0	3.5	4.96	1.49	1.27	28.91	4.94	704.15	n/a	12.9
	OTM-1 (Frzn)	220.0	0.0	315.0	7.5	190.0	0.0	0.00	0.92	0.78	27.99	4.15	702.44	n/a	8.0
MAPPING *Drag Dens 95%*	OTM (Drag/GTE)	220.0	3.9	255.0	0.0	190.0	0.0	1.27	0.00	0.00	26.72	4.15	701.17	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	40.0	14.89	0.00	0.00	11.83	4.15	686.28	-	-
ADDITIONAL ΔV REQUIRED	QUARANTINE ORBIT (PQ)	220.0	17.0	255.0	0.0	190.0	0.0	5.39	0.00	0.00	6.44	4.15	680.89	4	652.9
RELAY *Drag Dens 95%*	OTM (Drag)	220.0	1.0	255.0	0.0	190.0	0.0	0.32	0.00	0.00	6.13	4.15	680.58	-	-
	ACS Rotation	220.0	0.0	255.0	0.0	190.0	2.0	0.73	0.00	0.00	5.40	4.15	679.85	-	-
	SUB-TOTALS		56.9		1156.9		83.8	52.01	177.37	150.76	S/C Dry Mass (kg)		670.30		
	MISSION TOTAL ΔV		1297.6												

Mars Global Surveyor

Spacecraft Dry Mass vs Mission ΔV Capability
(Spacecraft Injected Mass = 1060.0 kg)



MDJ 7/19/96

- REVIEW MOMENTUM MANAGEMENT FUEL RESULTS (6/21/96)
- MISSION ΔV BUDGET ROBUSTNESS
  - ISP VARIATIONS
  - INCLINATION CORRECTION ΔV
  - MARTIAN ATMOSPHERIC UNCERTAINTIES

MISSION ΔV BUDGET “SOFT LIENS”

- COLA (COLLISION AVOIDANCE) PENALTY (+5 M/S)
  => FINITE LAUNCH WINDOW (-30 SEC)
- RUSSIAN LANDER SYNCHRONIZATION (+2 M/S)
- PLANETARY PROTECTION - QUARANTINE ORBIT (+7 M/S)